

[0058] Shield pattern 516 is disposed on surface 534, which is adjacent to surface 532. As shown in FIG. 7, shield pattern 516 is substantially aligned with conductive pattern 512.

[0059] FIG. 8 provides a second view of the five layer inductor implementation described with reference to FIG. 7.

[0060] As described above, inductor 500 may include a plurality of conductive patterns. FIGs. 5,6, and 8 illustrate these patterns as having curved spiral shapes. However, these patterns may also have other spiral shapes. Accordingly, FIGs. 9-10 are views of exemplary spiral shapes. It is important to note that the present invention is not limited to these illustrated shapes. Other shapes may be employed without departing from the spirit and scope of the present invention.

[0061] FIGs. 9A and 9B are top views of an exemplary round spiral shape 900. FIG. 9A illustrates a counterclockwise orientation of spiral shape 900, while FIG. 9B illustrates a clockwise orientation of spiral shape 900. Spiral shape 900 has an outer end 902 and an inner end 904.

[0062] Orientation of spiral shape 900 is determined according to the path along spiral shape 900 from outer end 902 to inner end 904. As shown in FIGs. 9A and 9B, this path is a variable radius curve of approximately one and a half turns. In FIG. 9A, the path from outer end 902 to inner end 904 follows a counterclockwise oriented contour. In contrast, the path in FIG. 9B from outer end 902 to inner end 904 follows a clockwise oriented contour.

[0063] Spiral shape 900 has an outer radius 906 (designated by the symbol r) and an inner radius 908 (designated by the symbol i). As shown in FIG. 9A, r , is measured from a center point 910 to an outermost portion of outer end 902. Similarly, i , is measured from center point 910 to an outermost portion of inner end 904. Preferably, i is less than twenty percent of r . However, the present invention includes spiral patterns where i is larger than this value.

[0064] Between i and r is a mean radius, a , that is an average distance from center point 910 to outermost portions of spiral shape 900. Furthermore, spiral

shape 900 has a line width 912 (designated by the symbol w) that indicates the width of the path of spiral shape 900.

[0065] FIGs. 10A and 10B are top views of an exemplary square spiral shape 1000 having an outer end 1002 and an inner end 1004. FIG. 10A illustrates a counterclockwise orientation of spiral shape 1000, while FIG. 10B illustrates a clockwise orientation of spiral shape 1000. Like spiral pattern 900, spiral pattern 1000 includes a path between ends 1002 and 1004 that is approximately one and a half turns. Although FIGs. 10A and 10B show substantially square patterns, the present invention may also include any rectangular shape.

[0066] Like spiral shape 900, spiral shape 1000 has an outer radius 1006 (designated by the symbol r) and an inner radius 1008 (designated by the symbol i). As shown in FIG. 10A, r , is measured from a center point 1010 to an outermost portion of outer end 1002. Similarly, i , is measured from center point 1010 to an outermost portion of inner end 1004. Between i and r is a mean radius, a , that is an average distance from center point 1010 to outermost portions of spiral shape 1000. Furthermore, spiral shape 1000 has a line width 1012 (designated by the symbol w) that indicates the width of the path of spiral shape 1000.

[0067] FIGs. 11A and 11B are views of counterclockwise and clockwise orientations for an exemplary hexagonal spiral shape 1100. Like spiral shapes 900 and 1000, hexagonal spiral shape 1100 has an outer end 1102 and an inner end 1104. The path along spiral shape 1100 that is taken from outer end 1102 to inner end 1104 determines whether spiral shape 1100 has a counterclockwise or a clockwise orientation. FIG. 11A shows spiral shape 1100 having a counterclockwise orientation, while FIG. 11B shows spiral shape 1100 having a clockwise orientation.

[0068] Like spiral shapes 900 and 1000, spiral shape 1100 has an outer radius 1106 (designated by the symbol r) and an inner radius 1108 (designated by the symbol i). As shown in FIG. 11A, r , is measured from a center point 1110 to an outermost portion of outer end 1102. Similarly, i , is measured from center point

1110 to an outermost portion of inner end 1104. Between i and r is a mean radius, a , that is an average distance from center point 1110 to outermost portions of spiral shape 1100. Furthermore, spiral shape 1100 has a line width 1112 (designated by the symbol w) that indicates the width of the path of spiral shape 1100.

[0069] FIGs. 10A and 10B are views of an exemplary octagonal spiral shape 1200 that, like shapes 900, 1000, and 1100, has an outer end 1202 and an inner end 1204. The path from outer end 1202 to inner end 1204 determines the orientation of spiral shape 1202. FIG. 12A shows spiral shape 1200 having a counterclockwise orientation, while FIG. 12B shows spiral shape 1200 having a clockwise orientation.

[0070] Similar to spiral shapes 900, 1000, and 1100, spiral shape 1200 has an outer radius 1206 (designated by the symbol r) and an inner radius 1208 (designated by the symbol i). As shown in FIG. 12A, r , is measured from a center point 1210 to an outermost portion of outer end 1202. Similarly, i , is measured from center point 1210 to an outermost portion of inner end 1204. Between i and r is a mean radius, a , that is an average distance from center point 1210 to outermost portions of spiral shape 1200. Furthermore, spiral shape 1200 has a line width 1212 (designated by the symbol w) that indicates the width of the path of spiral shape 1200.

[0071] The orientation of spiral conductive patterns in multiple layer inductor 500 will now be described. As described above with reference to FIGs. 5-6, inductor 500 includes a plurality of surfaces arranged in a layered pattern, where spiral conductive patterns are disposed on two or more of these surfaces. For example, the inductor 500 implementation shown in FIGs. 6A and 6B includes spiral conductive patterns 510 and 512 that are disposed on surfaces 530 and 532, respectively. For this implementation, these layers are adjacent. As shown in FIG. 6A, spiral conductive pattern 510 has a clockwise orientation, while spiral conductive pattern 512 has a counterclockwise orientation. Thus, embodiments